

REPORTS
ON
INSECTS INJURIOUS TO HOP PLANTS,
CORN CROPS, AND FRUIT CROPS

IN
GREAT BRITAIN,

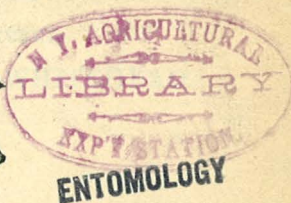
PREPARED FOR THE
AGRICULTURAL DEPARTMENT,
PRIVY COUNCIL OFFICE,

BY
CHARLES WHITEHEAD, Esq., F.L.S., F.G.S.

1885.

(No. I.—Insects Injurious to Hop Plants.)

Presented to both Houses of Parliament by Command of Her Majesty.



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1885.

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PRIVATE COUNCIL OFFICE,

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(No. I.—Insects Injurious to Hop Plants.)

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ENTOMOLOGICAL

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1885.

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Barming House, Maidstone,

August 13th, 1885.

SIR,

IN accordance with the intimation conveyed in your letter of the 22nd of May last, that the Lords of the Council had accepted my offer to prepare for presentation to Parliament Reports on Insects Injurious to Hop Plants, Corn Crops, Fruit Crops, and Root Crops, I have the honour to forward the first Report of this series : namely, Insects Injurious to Hop Plants.

I am now engaged on the Reports relating to Insects Injurious to Corn Crops and Fruit Crops, which will, I hope, shortly be ready. The Report upon Insects Injurious to Root Crops will be finished early next year.

I have, Sir, the honour to be,

Your obedient servant,

CHARLES WHITEHEAD.

The Clerk of the Council,

&c. &c. &c.

Agricultural Department,

Privy Council Office.

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REPORT.

No. I.—INSECTS INJURIOUS TO HOP PLANTS.

INTRODUCTION.

There is an increased and increasing risk of loss and destruction from injurious insects to many of the cultivated crops of this country.

Thus, corn of all kinds, fruit trees, hop plants, clover, turnips, and mangel wurzel are continually attacked by insects, both of kinds well known and long known, as well as of kinds that are new, or whose ravages have only been recently noted, and which in certain cases, as the mangel wurzel fly, *Anthomyia Beteæ*, seem to have been imported with the plant. The mischief caused by this fly has become greatly intensified even within the last five years. Curtis, writing of it in 1859, thought that its injuries would not be of much consequence. Again, the "turnip fly" or "flea," *Phyllotreta nemorum*, has enormously multiplied with the extension of turnip culture, and in some seasons has caused very heavy losses to farmers. Originally feeding upon charlock and other cruciferous plants, it leaves these now for more grateful food, and breeds rapidly in these favourable circumstances.

Naturally this increase of insects follows *pari passu* the extension of culture and the distribution of the plants which are the special subjects of their attacks. But it is found that in the case of wheat, and clover, and other crops, which have been cultivated in due rotation in the same fields new injuries from insects have been noticed. It must be remembered, however, that the number of observers among agriculturists has increased of late, and the manner of observation has been changed and

improved. It is of course quite possible that the supposed new insects may have been working unnoticed for generations.

Admitting to an extent the advance of intelligent observation and the spread of entomological knowledge, it is quite clear that not only is the destruction occasioned by insects larger than ever it was, but that there are insects at work in the fields which were not there in the times of our forefathers. One reason for the progressive increase of insects is that a larger supply of food encourages the proportional propagation of insects fond of and living upon it. Another undoubtedly is that the systems of land treatment have completely changed, and become more artificial, by which the balances of nature, "the aggregate action and "product of many natural laws," as Darwin has it, have been disturbed.

Insectivorous insects, for example, may have been diminished by changed methods of management. High and altered farming may have made certain crops more delicate and liable to insect attack. The slaughter of insectivorous birds and animals is most wholesale and indiscriminate. The hand of every one, to take an instance, is against moles, and yet farmers wonder that wireworms become more abundant each succeeding season.

With regard to new insects there are continuous opportunities for their introduction into England in all kinds of agricultural produce from all kinds of climates and soils. Insects are probably imported into as they are exported out of England. Fortunately the climate of this country does not suit the habits of most foreign insects. The dreaded potato bug, *Doryphora decemlineata*, would have without any doubt gained a settlement here if the conditions had been suitable. But on the other hand it is tolerably certain that the hop aphid was taken to America in hop roots or sets sent from England. Until 25 years ago, Professor Lintner states, this insect was unknown in the American hop plantations, and now it is becoming a serious trouble. Several other insects destructive to corn, hop, and fruit crops have been brought into America from Europe with seeds, plants, and fruits, and are threatening to become more troublesome in this "home of insects," as America has been called by entomologists, than they ever were in their native land. America has retaliated by exporting the Phylloxera into the French vineyards, to the utter confusion and indescribable loss of the wine producers. Within the last few years scale insects have appeared in the Californian orange groves from Australia, and orange, citron, and lemon growers in other parts of the world have lately been exercised in their minds by the appearance of pests of this species.

Seeing then these dangers from the spread of indigenous insects, and the fear of the introduction of new species from

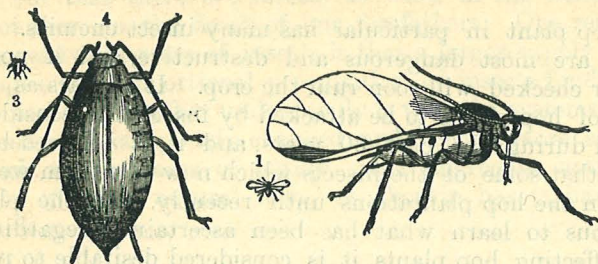
foreign countries, it is most desirable to diffuse entomological information as to the habits and life-history of injurious insects in a simple and intelligible form, for the use of farmers, fruit-growers, market gardeners, and all who cultivate the land, and at the same time to give practical modes of prevention, and remedies against their attacks.

The hop plant in particular has many insect enemies. Some of these are most dangerous and destructive, and if not prevented or checked will soon ruin the crop. It appears as if the liability of hop plants to be attacked by insects has considerably increased during the past 30 years, and it is believed by hop planters that some of the insects which now vex them were not known in the hop plantations until recently. As the planters are anxious to learn what has been ascertained regarding the insects affecting hop plants, it is considered desirable to publish this record of 10 species of insects more or less injurious to them, giving descriptions of each insect, together with its life history, its modes of attack and the results of its injuries, also an account in some detail of methods of prevention, and of measures which have been found efficacious in stopping or alleviating injuries.

and wild plants of this country are infested with
species of aphids which in some seasons favourable for their
development and increase are infinitely destructive. These
growers know how often these flowers are spoiled by the
aphids. Fruit producers often suffer much from the species
which attack current bushes, plum, damson and peach trees.
The line tree whose blossoms are delightfully fragrant is
constantly so beset by the pest, that it is impossible
to sit under its shade on account of the shower of honey dew
that fall from the regions of insects on its leaves.
The losses to hop planters occasioned by the hop aphid have
been almost incalculable. Hop planters have been liable to its
attacks for at least 200 years. It appears from records of these
attacks "black blights" that they have been of more frequent
occurrence during the last 50 years. It would be difficult to
give accurate estimates of the losses to hop planters and to the
whole community caused by the ravages of aphids. In the
last serious blight in 1822 not a hop was raised in many
important hop-growing parishes and it was estimated that the
whole produce of the hop land in England as 619 notes in 1822,
did not exceed 11,432 cwt. or an average yield of 11 cwt.
per acre. The annual average yield of the English plantations
is about 7 cwt. per acre or a total yield of 459,332 cwt. upon
the average of 1862, which at 7s 7d per cwt. the average
price of English hops, taking the 20 years previous to 1862,
would represent a total value of £3,376,177. The picking of an
average crop of hops upon the average of 1862 would cost

THE HOP FLY. *Aphis humuli*.

FIG. I.



1 & 2, Winged female Aphis; 3 & 4, larvæ or lice, nat. size and mag.

This is a species of the large tribe *Aphidinae*, of the genus *Phorodon*, thus distinguished because its species have toothed frontal tubercles, most developed according to Mr. Buckton, in the wingless viviparous females. Very many of the cultivated and wild plants of this country are infested with peculiar species of aphides, which in some seasons favourable for their development and increase are infinitely destructive. Rose growers know how often these flowers are spoiled by the rose aphis. Fruit producers often suffer much from the species which attack currant bushes, plum, damson, and peach trees. The lime tree, whose blossoms are delightfully fragrant, is constantly so beset by the *Pterocallis tilia* that it is unpleasant to sit under its shade on account of the showers of honey dew that fall from the legions of insects on its leaves.

The losses to hop planters occasioned by the hop aphis have been almost incalculable. Hop plants have been liable to its attacks for at least 200 years. It appears from records of these attacks, "black blights," that they have been of more frequent occurrence during the last 50 years. It would be difficult to give accurate estimates of the losses to hop planters and to the whole community caused by the ravages of aphides. In the last serious blight in 1882, not a hop was picked in many important hop-growing parishes, and it was estimated that the whole produce of the hop land in England, 65,619 acres in 1882, did not exceed 114,832 cwts., or an average yield of $1\frac{3}{4}$ cwts. per acre. The annual average yield of the English plantations is about 7 cwts. per acre, or a total yield of 459,333 cwts. upon the acreage of 1882, which at 7*l.* 7*s.* per cwt., the average price of English hops, taking the 20 years previous to 1882, would represent a total value of 3,376,177*l.* The picking of an average crop of hops upon the acreage of 1882* would cost

* The hop acreage in 1884 had increased to 69,258 acres.

from 350,000*l.* to 380,000*l.*, whereas the cost of picking the crop of 1882 did not amount to more than 155,000*l.*; so that the labourers who depend upon the hop picking suffered considerably.

MODE OF ATTACK AND RESULTS.

The hop aphid appears upon the hop plants generally about the beginning of May, and if the conditions of temperature and of the plants are favourable it propagates with astonishing rapidity. The never-ending still-beginning swarms live entirely upon the sap of the plants, and suck it up by a kind of pumping process with their monstrously long beaks, attacking first the youngest and smallest leaves of the leading shoots, which are more succulent than the older leaves. After a week or two the growth of the plants is checked and they struggle in vain to reach the tops of the poles. Their juices are exhausted by the continuous suckings of these insects, and the respiratory action of the leaves is stopped as to their under surfaces, upon which the aphides always congregate and feed, by their filth and exuviae, and upon their upper surfaces by the "honey dew," a peculiar glutinous sweet secretion ejected from the bodies of the aphides; this falling upon the leaves effectually prevents them from absorbing oxygen into their tissues. After this, which, as a rule, happens from three weeks to a month after the appearance of the insects, the plants give up, the leaves turn black and fall off, and all chances of a crop are lost. Heavy thunder showers often give renewed vigour to the plants at this stage by cleansing the leaves and partially restoring respiration, and this makes country folks say that lightning kills the aphides.

Sometimes it happens that aphides do not appear upon hop plants, or at least, not in dangerous numbers, until the cones are formed; in this event they get inside the cones and increase with greater rapidity than ever, blackening and disintegrating these so that they cannot be picked. This is the most feared kind of attack, as no remedies can be applied when the cones are formed, nor can the insect enemies of the aphides get at them easily.

With regard to the liability of hop plants to be blighted by aphides, there is no doubt that arrested growth and sudden checks from change of temperature predispose them, as vines and other plants are predisposed, to receive insect attacks, as well as various disorders. It is deemed expedient, therefore, by practical planters, as by practical vine cultivators, not to dress or cut the plants too early in the spring, because young shoots, especially, as Dr. Sachs says, when the parts of the plant are of small size and have a large hairy surface, as is the case with the leaves and internodes of the hop plants, are particularly liable to be injured by radiation in the clear cold mornings of the spring season.

In 1882 the advantages of late dressing were apparent. Severe white frosts in the beginning of April much injured the

forward binés and made them stunted and brittle, while those dressed late and therefore untouched by the frosts, escaped injury to some extent, and in several remarkable instances were comparatively unharmed by the blight.

LIFE HISTORY.

Entomologists have not absolutely decided as to the manner in which the life of this aphid is carried on through the winter; but there is every reason to believe that it is continued by eggs deposited in the autumn by wingless females, as well as by hibernating aphides, at least in suitable winters. Wingless (apterous) females invariably produce the eggs, and wingless females are, it is believed, also the direct products of the eggs. These are important facts leading to valuable suggestions of means of prevention, for they prove almost conclusively that the egg is placed upon or near the plant upon which its depositor has been nourished. In the case of the hop plant which is cut down nearly close to the ground in September, the aphid deposits its eggs in the ground hard by, or upon the short pieces of bine that are left upon the hop stocks, and upon the binés that are subsequently carried away for litter.

The larva extruded from the egg is nearly as large as the full grown larva, or louse as it is commonly called in the hop districts (Fig. I. 1), but it presents certain differences of form, and particularly in respect of its cornicles. It is very active, having an enormous beak or rostrum, which it uses at once, and if conditions of food and temperature suit it begins to propagate its species after the extraordinary manner of reproduction of successive broods of larvæ or lice, like itself, without sexual coition and influence of the male. Professor Owen writes of this as follows:—"This larva, if circumstances of food and warmth be favourable, will produce a brood and indeed a succession of broods of larvæ like itself, without any connexion with the male. In fact no winged males have appeared at this season. If the virgin progeny be also kept from any access to the male each will again produce a brood of the same number of aphides; and carefully prosecuted experiments have shown that this procreation from a virgin mother will continue to the seventh, ninth, or eleventh generation, before the spermatric virtue of the ancestral coitus has been exhausted." Réaumur has stated that one aphid may be the mother of 5,904,700,000 individuals during the month or six weeks of its existence. With this amazing power of increase it is not wonderful that the hop plantations are devastated, nor that the hop planters anxiously seek information, and methods of prevention and remedies against these attacks.

A general distribution of aphides is made throughout the hop plantations by means of winged females carried by the wind. These are perfect insects (Figs. I., 1, 2) which are viviparous, and

they appear from time to time in circumstances and from some causes not clearly ascertained, among the broods of wingless larvæ upon the leaves. Buckton remarks that a change takes place in the larva of the aphides. Swellings occur on the sides of the meso- and meta-thorax with which the wings of this future imago or perfect insect, are developed. These altered forms constitute the pupa which often shows considerable difference both in markings and colour.

It is certain that when food begins to fail upon aphids infested plants, batches of winged aphides appear and fly away to fresh fields and pastures new.

There is a regular general migration, or movement of winged females, early in the season, between the 20th and 31st of May generally, which can hardly be caused by a failure of food, and a large migration in the autumn when all the generations of viviparous larvæ are exhausted. The male comes on the scene, always in winged form, towards the autumn and pairs with the wingless oviparous female from which coition the innumerable swarms are generated, to blight and ruin the hop crop of the next season.

Miss Ormerod is of opinion that a variety of hop aphids *Aphis mahaleb* also infests the hop plants equally with the sloe and damson trees, and that in blighting seasons winged females of this variety migrate from these to the hop plants. Miss Ormerod points out that these are very slight varieties of the common species, and are so similar in habit as regards injury to hop plants that for all practical purposes they may be considered one. This adds very much to the chances of blight, as damson trees are very largely cultivated in all parts of Kent, and in Herefordshire and Worcestershire, on all sides of the hop plantations.

PREVENTION.

One of the best modes of prevention in the case of aphides is undoubtedly to put caustic substances, as lime, soot, lime ashes, and others, round the stocks, or plant-centres, during the winter. Bines should be carefully collected and removed from the hop gardens before February. All dead pieces of bine should be cut away from the stocks and burnt or taken away. The outsides of the hop gardens should be kept brushed, and weed growth prevented. If damson trees near are infested with aphides—not the ordinary plum aphid (*Aphis pruni*), which is distinct from the hop aphid, but the *Mahaleb* variety, which so closely resembles it—they should be washed with soft soap and water to prevent the migration of flies to the hop plants.

REMEDIES.

No remedy for aphid blight in any way effective was discovered until about 35 years ago, when washing the plants was adopted

to disturb the insects and to cleanse the leaves. Water alone was used, without much effect. Then soft soap was used with the water, and sometimes a little tobacco juice was added. This mixture is fairly efficacious if applied properly and often enough, but the best mixture is water, soft soap, and quassia. Quassia and water will not answer without soft soap, as the aphides have the power of resisting liquid without soap. It simply runs off and over their bodies, as water runs off and over the backs of water fowls. When soap is mixed with water and quassia the detergent nature of the soap neutralises their oily secretion and exposes them to the action of the liquid, and fixes the bitter of the quassia on the leaves, making them unpalatable. The soft soap also acts as a lubricator of the pumps of the machines employed for washing the plants.

The best composition is—

100 gallons of water - Soft water if possible, or if hard,
with soda added.

4 to 5 lbs. of soft soap - Pure.

6 to 8 lbs. of quassia - Boiled well to get full extract.

This wash is sent up, squirted up and over the hop plants—the play of the jet being directed to the under surfaces of the leaves—by means of large garden engines with strong pumps and long flexible hose, and jets held under the leaves by men. Large planters employ washing machines* drawn by horses between the rows, whose pumps are worked by the wheels and force the wash up and over the plants through a series of tubes perforated at intervals.

This washing process in order to be perfectly successful must be commenced directly there is any deposit of lice upon the leaves, and continued systematically until all of these have been cleared off. In some seasons fresh flies are continually wafted to the plants, and in this case it will be necessary to wash frequently and watch the plants with great care.

The advantages of washing hop plants for aphid blight were clearly shown in 1882. Planters who washed grew crops of from 7 to 9 cwt. per acre, while those who did not wash their plants grew nothing or next to nothing.

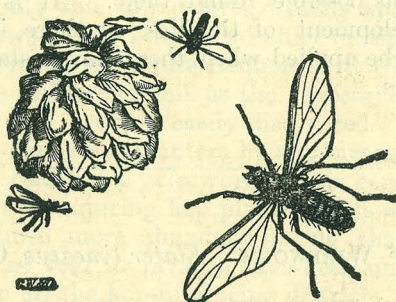
In connexion with remedies against aphides it should be pointed out that the chief natural enemies of the hop aphides are the little spotted beetles commonly called ladybirds, *Coccinella*, and that these should be religiously preserved in all hop districts. They have been known to avert an impending blight, coming in countless quantities and devouring the aphides as fast as they were generated. In America insects and animals that

* The horse washing machines have recently been much improved.

destroy insects injurious to crops are encouraged and protected. Among one of the remedies for the attacks of insects given by the entomologist of the State of New York is "Colonising lady bugs, the Coccinellidæ, upon house plants and other vegetation infested with plant lice."*

THE HOP CONE FLY, FEVER FLY. *Dilophus vulgaris*.

FIG. II.



DILOPHUS VULGARIS.

Female Fly, magnified and nat. size, flying round Hop cones.

This is one of the numerous species of *Tipulidæ*, of the sub-family *Bibionides*, according to Westwood. Several of those species do much injury to plants both in their larval state, in which they bear more or less resemblance to the larvæ of the common Daddy Longlegs, and in their winged state. According to Taschenberg asparagus, ranunculi, barley, rye, and other plants are attacked by different species. Curtis speaks of this larva as injuring potatoes. The larvæ of the *Dilophus vulgaris* were found in hop roots in Kent, as Miss Ormerod reports; and the flies were found in hop cones at Rainham, in Kent, towards the end of August. Hop cones were sent to the writer from the neighbourhood of Maidstone full of these flies, which had evidently much injured the cones. The male fly is black and smaller than the female, whose colour is rather lighter. Miss Ormerod says that this fly sometimes appears in large swarms, especially upon the Norfolk coast in 1862, when it was recorded as hanging in millions on flowers, and in bunches on grasses.

* A small spider-like insect of a red colour has been exceedingly active in clearing off the hop aphides this season. It is not yet determined as to its exact species.

PREVENTION.

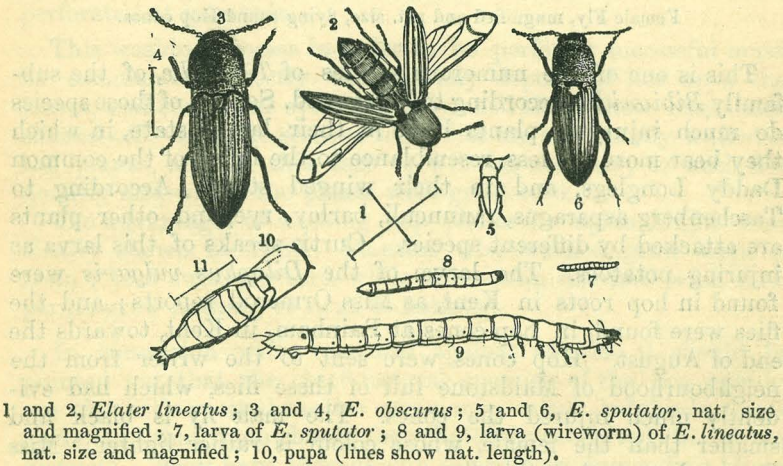
It is supposed by Curtis and considered most probable by Miss Ormerod that the eggs of this fly are laid in manure. In this case the grubs or larvæ are taken with the manure close to the roots of the hop plants. Manure heaps or mixens lying in the neighbourhood of recent attacks, or where flies have appeared, should be carefully turned and treated with lime.

REMEDIES.

When it is ascertained that the grubs or larvæ of the hop cone fly are doing mischief to the plant-centres, dressings of lime, soot, lime ashes, or of sawdust or ashes steeped in paraffin oil should be put as closely as possible round them.* It is important to prevent the development of the flies, as there is no remedial measure that can be applied when these have established themselves in the cones.

THE HOP WIREWORM. *Elatér lineatus*, Curtis.

FIG. III.



This is one of the most destructive insects known to agriculturists. It is especially injurious to wheat, barley, oats, rye,

* In America about one quart of paraffin oil is put to a wheelbarrow load of ashes, and very carefully mixed.

turnips, grass, and hops. It is well known in Germany and other continental countries, where it does much harm to most crops, and to young hops. According to Harris and Professor Lintner there are allied insects in America, which work and destroy in the same manner as the European wireworm, though differing in certain respects.

Wireworms are most troublesome in newly-formed hop plantations in England, particularly in those which have been made upon recently broken up grass land. Planters do not, and very naturally, like to pare and burn the turf or sward with the rich stores of humus, this is therefore ploughed deeply in, and legions of wireworms with it. These being deprived of the roots of the grasses attack the newly planted hop sets, boring into their stems, sucking out the sap, and gnawing off the shoots as fast as they make their appearance, as it would seem in mere wantonness. It frequently happens that the plants die from the attacks, or are only able to put forth weakly and useless shoots. Sometimes wireworms do infinite mischief in established plantations, causing injuries which are frequently attributed to natural decay, or to the soil or subsoil, as the insects bury themselves into the stocks, and are not easily discovered. This cannot be said to be a new foe to hop planters by any means. Lance speaks of it, though he confounds wireworms with centipedes. Curtis also alludes to it as injuring hop plants. But without doubt it has been very much more abundant during the last five years, and in the present year its ravages have been unusually great in various places in all the hop-producing districts.

LIFE HISTORY.

The wireworm is the grub or larva of the click beetle, *Elatér lineatus*, of the family *Elatéridæ*, sub-tribe *Serricornes*, of the order *Coleoptera*, according to the rational classification of Westwood. It is called "click" because the beetle, if placed on its back, has the power of giving a mighty spring in the air ten or twelve times its own length, at the same time emitting a snapping or clicking sound. The grub, or wireworm, is sometimes confounded by agriculturists with the grub of the Daddy Longlegs, *Tipula oleacea*, which is quite a different insect.

The perfect winged insect, which may be noticed frequently in meadows and by edge sides in August, lays very small eggs on the stems or leaves of grasses and other plants, and the lower parts of the hop bines. From these eggs a grub, or larva, is produced, which begins at once to feed upon the plants, generally attacking the most vital point just above the root, and in hop plants at the base of the shoot springing from the fibrous part of the hop set. The grub is very tiny at first, a little white worm, as Curtis describes it, and hardly perceptible; it grows very

quickly to the full size of the wireworm stage, in which it remains five years. Some entomologists say that it keeps in this state longer than five years : Taschenberg says for many years. Miss Ormerod thinks the term depends probably on the supply of food ; but it has been proved to live for years in larval condition. It is yellow, with a smooth horny skin enabling it to move in the earth, and to go down very deeply into it with ease and rapidity. It changes to the chrysalis state in the earth, as Taschenberg says, without a cocoon, and makes its way to the light, emerging in perfect winged form, to pair, and to deposit eggs upon the hop plants, or herbs, or plants, or weeds near.

PREVENTION.

In old hop plantations, it is somewhat difficult to prevent the attacks of the click beetle, especially in small fields and those surrounded with woods and hedgerows. Where hop plantations are in masses the injury from this source is usually comparatively inconsiderable. It is most desirable to keep the land clear from weeds upon which the insect might deposit eggs ; also the out-sides well cleaned and closely brushed and free from grass and nettles. This weed is, it should be stated, very attractive to many insects hurtful to hop plants, and should therefore be studiously eliminated from their neighbourhood.

Caustic substances dug in round the plant-centres will prevent, or, at all events, retard an attack from outside or below, but will not prevent the action of wireworms generated close to and upon the plant-centres. Opening a trench in the autumn, after the poles are down, and forming a ring close round the plant-centres, and putting in earth, ashes, or sawdust saturated with paraffin oil is an excellent plan in the case of plantations that are badly infected. Hard frosts do not affect wireworms since they go down into the earth to a depth of nearly 15 inches.

Before planting pasture land or meadow land with hop plants it is most necessary that it should be kept well fed down by sheep up to the time of ploughing in the autumn. With regard to arable land taken for hop plantation, this should be freed from weeds during the summer. A crop of white mustard might be taken with much advantage before planting, as the wireworms cannot live in this, and would be starved out.

Planters who suspect the presence of wireworms very frequently set a row of potatoes between the rows of hop plants in order to draw the wireworms from the young hop plants.

Birds should be encouraged in infested fields. Rooks devour quantities of these insects. Pheasants, partridges, and many small birds also greedily eat them. Moles are especially devoted to them. Instead of every farming man's and every farming boy's hand being set against moles, instigated thereto by a

reward of 2*d.* per tail, farmers, and hop planters in particular, should rather encourage their increase. In the United States the State entomologists recommend the protection of the disagreeable skunk on account of the service it renders the hop planter by discovering and destroying the grub of the otter moth, which attacks the roots of the hop plants, and many other insects upon which it feeds. The barbarous traps for killing moles should be prohibited, and when it might be necessary to banish moles, in gardens and where small and delicate plants are cultivated, traps might be made for catching them alive and transporting them to insect affected spots.*

In a young hop plantation this year potatoes were set between the rows of plants. Upon hoeing the potatoes it was found that moles had made a subterranean gallery up almost every row of potatoes in search of their favourite food.

REMEDIES.

When wireworms have once become settled in a hop plantation it is a most difficult matter to dislodge them. They have a stronghold in and around the plant-centres, in which they ensconce themselves, and they cannot easily be got at. Nitrate of soda, guano, lime, soot, and other manures of a caustic nature have been put as near the plants as it would be safe to put them, and in most cases without much success. The wireworms work upon and in the young shoots, to which it would be most injurious to apply substances that would affect the insects.

It is almost impossible to move them from their position by cultivation. They are frequently moved, at all events temporarily from wheat, oat, and turnip plants by heavy rolling and harrowing, but it will be seen that such remedies cannot be applied in hop plantations. Digging or prong-hoeing round the plants might be advantageous, though the grubs actually upon them could not be directly reached.

In young hop plantations of the first year it has been found practicable and efficacious to make a ring very close round the plants with the little short hoe used for covering in after dressing, and to sprinkle earth, ashes, or sawdust saturated with paraffin oil in these, taking care not to put too much oil, so as to kill the shoots. Planters will see that this cannot be so easily done in the first year of poling and afterwards, still with care and contrivance it might be managed, even when the full complement of poles is set up. But the best and most sure means of deal-

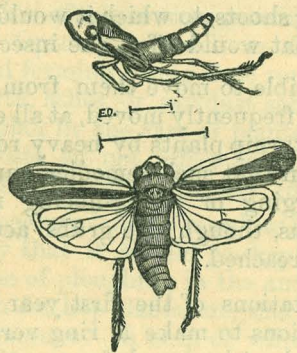
* Miss Ormerod states that special traps, "mole pots," are made in Gloucestershire for catching moles alive. These are earthen jars, which are let into the ground, level with the runs of the moles. They fall into these and cannot get out, and may be taken out alive.

ing with wireworms when at work upon hop plants is to put baits near them, two or three inches below the ground, in the shape of pieces of mangel wurzel, turnip, carrot, potato, or rape cake. These should be taken up once a week at least, and wireworms attracted by the more pleasant food from the hop plants, will be found imbedded in them, and may be taken out and destroyed. As many as 150 wireworms have been caught in this way near one plant-centre. Continental and American entomologists and planters highly commend this method.

Dressings of rape dust dug in round infested plants will also draw the wireworms, relieving them for a time, but also tending to collect the wireworms round or near the plant-centres. Rape dust is employed as a manure for hop plants in enormous quantities, and this without doubt has caused the increase of wireworms in hop plantations, as they are particularly fond of it. The common notion that rape dust is a remedy against wireworms, because they eat so greedily of it that they burst their skins, is without any foundation at all.

THE HOP JUMPER. *Euacanthus interruptus*, Linn.

FIG. IV.



EUACANTHUS INTERRUPTUS.

Hop Jumper, winged and in early stage, magnified ; lines showing nat. size.

This insect is often confounded with another species of the same family, *Cercopidæ*, distinguished as *Aphrophora spumaria*, because the larvæ are covered with a frothy liquid, vulgarly called "cuckoo spit," or frog's spittle, and supposed to be caused in some mysterious manner by cuckoos and frogs. Professor Westwood states that the ancients believed that these insects were generated by the above-mentioned animals, and the tradition has been handed down to the present day. Although the

frog flies, or cuckoo flies, *Aphrophora spumaria*, live by sucking the juices from plants and trees in the same way as the veritable jumper (*Euacanthus*, Westwood; *Amblycephalus interruptus*, Curtis; *Euacanthus interruptus*, Linnæus), and have the same wonderful powers of leaping, these insects are specifically distinct.

An allied species, much smaller than the hop jumper, attacks rose trees: another is found upon lime trees. Two other species, also smaller, the *Eupteryx picta*, and the *Eupteryx solani*, infest potato plants, and Curtis found the former upon mint, burdock, and nettles.

In America a species of leaf hopper, belonging to the same family, does enormous mischief to grape vines by puncturing their leaves and exhausting the juices of the plants.

Old writers upon hops, as Reynolde Scott, and Bradley, do not allude to this insect, nor do Lance and Rutley, who wrote 47 and 35 years ago, notice it as injuring hop plants. It is only within the last 20 years that the planters have seen it in their plantations, or, at least, have connected it with the sickly condition of the plants in certain seasons. Since this time it has rapidly increased, and occasionally during the last six years it has caused most serious mischief, especially where the plants have been naturally weakly or backward.

Upon banks and upon indifferently tilled land, as well as upon stony and light land, they are more troublesome, making onslaughts upon the hop bines, generally towards the middle of May, or when they have been tied up to the poles, by thrusting their beaks into the leaves and into the tender, juicy, leading shoots, from which the sap may often be seen exuding in large drops. After a while the weaker plants turn yellow; their growth is completely arrested. The stronger plants manage to struggle upwards, but their strength and powers of production are materially diminished by the continuous drain upon them. In seasons of slack delicate, or backward bine the consequences are very serious. When the bine is plentiful and vigorous it manages to grow away from its persecutors, but the jumpers remain and multiply, feeding upon it.

Many hop plantations were all but ruined in Hampshire and Surrey and in parts of Kent by its ravages two or three years ago. The leaves curled up, the leading shoots ceased to revolve, and no crop was produced.

LIFE HISTORY.

The insects appear first upon the hop plants as small larvæ. When they have arrived at their full larval size they "moult," as the planters say, leaving their skins upon the leaves. Another moult occurs after the pupa stage, when the perfect winged

insect is formed. In all of these stages the injury to the plants is continued. Pairing then takes place, and the female lays eggs and dies. It is not clear where the eggs are deposited, nor has it been ascertained whether the life of the insect is carried on by eggs through the winter, or by hibernating larvæ. Some of the species of this family deposit eggs under the rind of plants in the autumn, which are hatched in the early spring, as the *Typhlocyba Rosæ*. Another, *Jassus sexnotatus*, according to Taschenberg, lays them either in the ground or upon the roots of plants just below the surface of the ground. Harris speaks of a species, *Tettigonia vitis*, in America, whose larvæ retire for shelter during the winter beneath fallen leaves, decaying tufts, and roots of grass. Reasoning, then, by analogy, and from what is actually known of these jumpers, it seems certain that they are concealed in egg or larval form close to the hop plant-centres, in the ground or within the cracks of the poles, during the winter. Their continuity of existence is not carried on by means of eggs upon or under the rind of the hop plants, because these are cut down in the autumn and carried away. The plant-centres, or perennial stocks, remain, with pieces of bine upon them only a foot in length, and small pieces of bine get broken off and lie on the ground throughout the winter. Their rind shrivels up, and the eggs, if under it, would be destroyed. The poles, which remain upon the ground, stacked close to the hop plants, are said to be depositories of the insect, either in egg or larval form; for Miss Ormerod reports that a plantation was so much infested with jumpers that it was grubbed, and the poles were removed to another ground till then free from jumpers, this was soon after as badly troubled with them as the old plantation.

As its name implies, this insect, in common with others of the *Cercopidæ*, has wonderful powers of leaping, with hind legs disproportionately long and furnished with well developed muscles.

The colour of the perfect insect is yellowish, with markings of brown on the wings, head, abdomen, and legs, varying somewhat in position and intensity. In the pupa stage further variations of colour may be noticed. Some specimens have been seen with crimson markings.

PREVENTION.

The roots and stocks of hop plants, forming plant-centres or "hills," remain in the ground for many years, and consist of congeries of interlaced fibres, affording succulent food for the larvæ, and convenient shelter for the eggs and larvæ of insects. Though without doubt many of them would be affected and decreased by application of caustic and disagreeable substances dug in round the plant-centres, there are some which would

escape; still it would be desirable, after a very bad attack of jumpers, to "open round" the plant-centres, that is, to clear away the earth from them, leaving a trench round the fibrous stocks, which would lie exposed during the winter. Planters adopted this course formerly after a visitation of mould or mildew to let the air in and to destroy the germs or spores of the fungus. Caustic substances could then be put close to the stocks, as lime, lime ashes, soot, nitrate of soda, sulphate of ammonia. Dressings of sand, sawdust, wood ashes, or finely triturated earth, with which paraffin oil should be mixed, might be sprinkled all round the stocks with very much advantage. Opening in the manner described would be very effective, but if this could not be done the soil all round the stocks should be well dug and pulverised as early as possible directly after the poles had been set up, and caustic substances put on before the digging operation.

REMEDIES.

When the jumpers are in full force upon the hop plants the only remedy available, or that has been proved to be practical and effectual, is to hold tarred boards, or tarred sacking, on two sides of the plants low down in the alleys, and to have the poles tapped smartly with a stout stick. The insects, which are very timid, as may be seen by the way they dodge round the poles, take a mighty leap after this shock and jump into the tar. Thousands can be caught by this means in a day in badly infested plantations. Washing with soap and water does not seem to have much effect upon them.

THE HOP FLEA (OR BEETLE). *Haltica concinna*.

FIG. V.



HALTICA CONCINNA.

1 and 2, Hop Flea, nat. size and magnified; 3, hind leg, magnified, showing tooth.

This insect to ordinary observers closely resembles the turnip flea proper, *Haltica nemorum*. Under the microscope it will be seen that it differs considerably. Its colour is brassy, wherea

the colour of its congener is dusky or black, and its wing cases are striped. They both have wonderful powers of jumping. The former has a curious toothed formation of the tibia, or shank, with a set of spines, while the tibia of the turnip flea is without any curve. Curtis speaks of the *Haltica concinna* as infesting hop plantations. Taschenberg also alludes to its eating the leaves of hop plants in Germany. Harris gives an account of several species of *Haltica* in America as destructive to crops, but he does not mention this particular species.

In some seasons, more especially when the hop plants are backward and are kept back by cold unkindly weather, these fleas or beetles do infinite harm to them by eating the leaves and making many holes in them with strong jaws furnished with double sets of teeth, and made purposely for biting out and masticating leaf tissue. They also much injure the leaves, and thereby weakening the plants by the larvæ burrowing in the parenchyma or cellular tissue of the leaves. They follow the bines as they grow, but it rarely happens that they are able to do much harm after the plants have really made a good start in favourable climatic conditions.

LIFE HISTORY.

The flea, in reality a winged beetle, passes the winter in the perfect state under clods, tufts of grasses, or weeds near the hop plants, or on the outsides of hop plantations. In early spring, directly the bines are ready to tie, they come up from the ground near the plant-centres, or fly from their retreats at a distance, and at once begin to eat and fret the leaves. Pairing takes place and eggs are laid under the leaves as well as on the smaller bines. Only one egg is laid daily by a female, so that these insects are not very prolific. In about eight or nine days larvæ, little white maggots, with six pectoral feet are hatched from the eggs, and immediately burrow in the leaves and feed upon their tissues. In about a week they become chrysalids, and in due time the perfect beetles appear again, and the life stages are repeated. Breeding goes on thus in favourable circumstances until September. It is alleged that the flea deposits eggs within the hop cones, and that the larvæ mining the strigs, or stems, cause the decay and disintegration of the bracts. This has not been quite determined, but it seems very probable that the serious damage to hop cones, which has increased so much within the last 10 years, may be caused by fleas, together with another insect which is described further on.

PREVENTION.

As the fleas rejoice in cloddy ground, or are at least always more plentiful when the soil is rough and unkindly, it is desirable to work well round the plant-centres early, and get a good

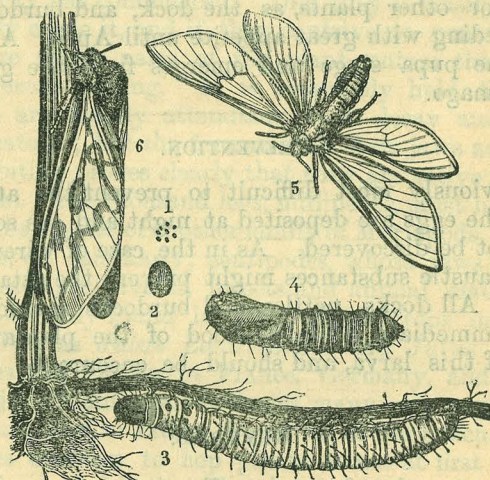
season all over the plantation as quickly as possible after poling. Weeds should be banished, both in the plantations and round the outsides. Pieces of old bine should be carefully collected and carried away when the ground is dug in the late autumn and winter, and when the plants are dressed the bits of bine should be taken away from the ground at once.* Thorough cultivation up to picking time is essential to keep the soil well moved and to prevent weeds, especially near the plant-centres. After a bad attack lime, or soot, or lime ashes, or guano should be put round the plant-centres in October and worked well in.

REMEDIES.

When hop plants are troubled by these fleas it is often very useful to put soot over and round the plants, and after a day or two to prong hoe the soil close to them and pulverise it as much as possible. They jump off the plants when disturbed and take refuge in the clods. In cases where the injury is very great, tarred boards or sacking should be held near the ground under the plants and the poles tapped with a stick, so that the fleas jump into and are retained by the tar.

THE OTTER MOTH. *Hepialus humuli*, Stephens.

(FIG. VI.)



1 and 2, Eggs, nat. size and magnified; 3, caterpillar; 4, chrysalis; 5, male; 6, female.

This is known as the Otter moth, so called on account of the peculiar shape and size of its larvæ. It is also called the Ghost

* These pieces of bine being hollow afford retreat and shelter for insects of many kinds.

moth, because the wings of the male are white and in its nocturnal flights, according to Westwood, it has a singular "pendulum like" movement which gives it a somewhat ghostly appearance. The body of the male is rather dusky, while the body of the female is lighter, and she has wings of a yellowish colour with orange markings.

It is known in Germany. Taschenberg and Kaltenbach both speak of it as destructive in German hop plantations. Near Aix its attacks were so severe that whole hop plantations were rendered unproductive. Harris describes it as the "hop vine caterpillar living in the roots of the hop," in his report upon American insects. The larvæ or caterpillars of this moth injure the roots of the hop by feeding upon them, biting the outside skins, and piercing through the interior of the roots with their strong jaws, but the extent of their mischief is not realised as they work so low down in the earth, and their action in killing or weakening the plant is frequently attributed to other causes. As it is most abundant in this country planters sustain more loss from this insect than they are aware of.

LIFE HISTORY.

The perfect insect appears about the middle of June. The female soon begins to lay eggs. Though these are very plentiful they are only deposited singly. After fourteen days the larva or caterpillar comes forth and crawls to the root of the hop plant, or other plants, as the dock, and burdock, where it remains feeding with great appetite until April. At this time it assumes the pupa stage and emerges from the ground as the perfected imago.

PREVENTION.

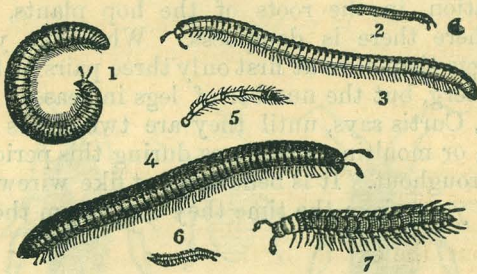
It is obviously most difficult to prevent the attacks of this insect, as the eggs are deposited at night and are so minute that they cannot be discovered. As in the case of wireworms application of caustic substances might prevent the attack if it were suspected. All docks, nettles, and burdocks should be removed from the immediate neighbourhood of the plantations. Moles are fond of this larva, and should be encouraged in hop plantations.

REMEDIES.

The only remedy of certain efficacy is to examine the roots of hop plants that are showing unaccountable symptoms of flagging just below the crown of the plant centre. The larva is a huge caterpillar, from an inch to an inch and a half in length, of a dull yellow colour, easily discernible and therefore might be picked out.

THE THOUSAND LEGS. *Julus Londinensis*.—*Julus Guttatus*.

FIG. VII.



1, *Julus Londinensis*; 2, 3, *J. guttatus*; 4, *J. terrestris*; 5, horn; 6, 7, *Polydesmus complanatus*; all magnified; and 2 and 6, nat. size.

The hop sets, or young plants, are rugose and knotty, affording much shelter or cover for the eggs, grubs, and pupæ of insects. Planters usually plant two or three of these sets together to form one plant centre. These, while keeping a separate or distinct existence, become much inter twisted, having many knots and cavities, hiding places, which are made use of by many species of the Julidæ or "thousand legs." These are very frequently found in such cavities and in great abundance, especially where any decay has commenced. This they intensify, if they do not actually cause it, and if they contrive to penetrate into the softer more sappy parts of the plant-centres they rapidly occasion dangerous rotting. It is commonly held that these thousand legs are merely attendants upon decay and do not themselves create it; but the formation of their jaws adapted for gnawing and biting proves clearly that they are active sources of injury to plants. The thousand legs, millipedes, must not be confounded with the species of another family of Myriapods, known as *Scolopendridæ*, or, familiarly, centipedes, whose jaws are quite differently formed and live on insects and animal matter. The two species commonly found injuring various crops in England are distinguished as *Julus Londinensis* and *Julus Guttatus*. Similar species are known in France, Germany, and America, where they injure beans, peas, cabbages, many corn crops and hop plants. The mischief, or rather the source of the mischief, which these creatures occasion to hop plants is not at first apparent, and it would be desirable that planters should examine the roots of the plants closely when they flag or show symptoms of disease.

LIFE HISTORY.

Strictly and scientifically speaking the thousand legs are not insects, though they are generally considered and may be treated

here as such. They undergo no transformation like wireworms and other insects proper, and have only two stages of life, viz., the egg stage, and the caterpillar, or worm stage.

From the end of December to the beginning of May the female lays eggs in considerable numbers under stones, in decaying wood, and vegetation, in the roots of the hop plants, and in other retreats where there is dampness. When the young emerge from the eggs they have at first only three pairs of legs, according to Taschenberg, but the number of legs increases. They are not full grown, Curtis says, until they are two years old, changing their skins, or moulting, five times during this period and feeding actively throughout. It is believed that like wireworms they live four or five years from the time they come from the eggs.

PREVENTION.

It is essential for every reason that hop land should be drained. For the prevention of thousand legs this is most desirable since they love moisture.

All vegetable rubbish and decaying matter should be removed from hop plantations which would serve as a harbour for them.

Frequent and thorough cultivation by digging round the plant-centres, and the application of nitrate of soda, soot, lime, or lime ashes, to be dug deeply into the soil close round them will be found very beneficial.

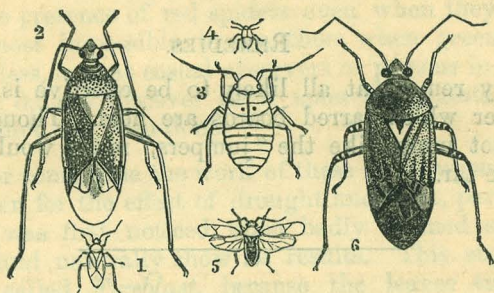
REMEDIES.

Traps of pieces of carrot, turnip, mangel wurzel, or vegetable marrow put round the plant-centres might be advantageously employed. This is done in Germany. Vegetable marrow is the best medium, being soft.

In the case of a serious attack the use of the paraffin saturated materials recommended in many other cases would be beneficial. Curtis talks of lime water being used with effect as well as of nitrate of soda being washed in. This would hardly be practicable.

THE HOP BUG. PLANT BUG. *Lygus umbellatarum*. *Lygus Solani*.

FIG. VIII.



1 and 2, Potato bug, *L. Solani*; 3 and 4, pupæ of do., nat. size and magnified; 5 and 6, *L. umbellatarum*, nat. size and magnified.

This insect gets its livelihood by extracting the juices of plants, into whose stem and leaves it thrusts its pointed beak or sucker. Many of them may be seen upon hop plants between June and September dodging quickly and craftily behind the leaves and bines to get out of sight. If the bines are examined it will be found that they are punctured in various places, from which punctures sap is issuing freely. This naturally weakens the plants and renders them unhealthy. In 1880, and in two previous years, considerable weakness was caused by the action of the hop bug in some of the Kent plantations. The *Lygus umbellatarum* is the principal offender, but specimens of *Lygus Solani* have also been seen upon hop plants, apparently feeding upon their juices, side by side with those of the other species. The former species is of a greenish colour, while the latter is more red and ochreous. Much damage is occasioned to various plants in America and Germany by plant bugs answering to the description of these English species, according to Harris, Lintner, and Taschenberg.

LIFE HISTORY.

The perfect insect hibernates in the ground in crannies of poles or bark, in litter or rubbish near the hop plants, or in the outsides of hop plantations. It is believed that the females deposit eggs when they arrive on the plants, whose larvæ begin to feed at once; the pupæ and the perfected insect also feed upon the plants in the same manner.

PREVENTION.

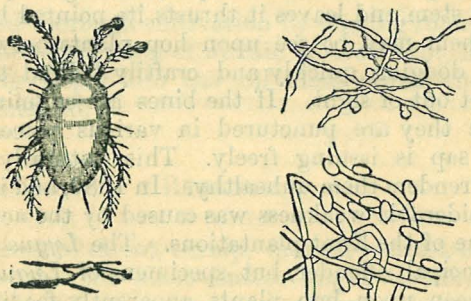
In the case of winged insects, and those having rapid locomotive powers, prevention is somewhat difficult. To keep the outsides of hop plantations well brushed and to have the brushings burnt late in the autumn is one of the most practical means. Also to let the ground in the plantation be free from weeds.

REMEDIES.

The only remedy at all likely to be effective is shaking the poles, under which tarred boards are held. Though the plant bugs do not jump, like the "jumpers," many would be shaken off into the tar.

THE RED SPIDER (*Spinning Mite*). *Tetranychus telarius*.

FIG. IX.



RED SPIDER. Hairs on the foot (from Claparede). Webs with eggs in dry and moist state, much magnified.

This is a species of the order *Acarina*, or mites, in which are included many familiar and unpleasant creatures, as ticks, cheese mites, itch mites, among others. A familiar but disagreeable acquaintance of country people—the harvest bug, *Tetranychus autumnalis*—is another species of the genus of spinning mites.

Gardeners know the *red spider*, as it is commonly called, which is found on the under leaves of many plants both in the open air and in greenhouses and frames, and make lamentations over the great mischief it causes. It is not a spider, being essentially different in form, as will be seen by the above figure, though it spins a kind of web upon the under surfaces of the leaves of the plants it infests, for its protection, and it has a peculiar arrange-

ment of stiff hairs with round terminations, as shown above, for the purpose of spreading and fixing this web. Nor is it always red. Its colour is also sometimes green, sometimes brown or brick red, varying, as some naturalists think, according to its food. Upon hop leaves it has been found of many shades of colour, ranging from green, with tiny black specks on the sides of the mite, all through the variations between brown and bright red, upon the same leaf, rather indicating that the differences in colour are hardly attributable to diet, but to degrees of age. It is difficult to detect the presence of red spiders even when they are bright red, and almost impossible to see them when green or brown without a glass, so that casual observers or persons in any degree shortsighted do not discover them upon hop plants until considerable injury has been done.

Indeed for some time the work of these mites upon hop plants was mistaken for the effect of drought and heat, particularly as the injury was first noticed upon badly drained spots, where drought would naturally show its results. This supposed disorder was called *Fireblast*, because the leaves turn bronze-coloured at first, then they become yellowish red, as if they had been burnt. In Germany the hop planters term it *Kupfer-Brand*. As red spider is only troublesome to hop plants in hot, dry seasons, it is easy to understand that its action may be mistaken for that of heat and drought.

Many would think it impossible that this tiny mite could work much harm upon the masses of vegetation in hop plantations. In 1868, when the summer was excessively hot and almost without rain, the crop was utterly ruined by red spiders, upon thousands of acres in England and upon the Continent. In Tasmania it is frequently very troublesome, so that the planters irrigate the hop land to destroy it in the ground before it can get to the plants. There was a sharp attack in England also in certain localities in 1872. During the late cycle of wet summers there was no sign of red spider. In 1884 there were clear indications of an attack in parts of Kent, Worcestershire, and Herefordshire. The weather changed, however, becoming damp and cool, and the mites could not work.*

In 1868, at the beginning of July, the lower leaves of the hop plants became discoloured, "fireblasted," as the labourers said. This discoloration rapidly spread upwards, extending even to the lateral shoots. After a time the leaves fell off, the plants being quite exhausted of sap, and it was impossible for them in most cases to form any hop cones. Where these were formed they quickly shrivelled up and dropped off. Upon close examination of the leaves they were found to be desiccated. Their juices had

* At this time (August 1885) the red spider is doing much injury, being favoured by the long drought.

been sucked out by myriads of mites, whose fine webs covered their under surfaces with countless filaments. Many plantations which in June were green and flourishing looked at the end of July as if a scorching fire had passed over them.

Not only do the mites exhaust the juices of the plants by means of the barbed suckers with which their mouths are fitted, but they hinder their respiration with their webs and excrements.

LIFE HISTORY.

The red spiders pass the winter in the perfect state, either in the ground near where they have fallen with the leaves they have injured, or in other convenient places of shelter. They have frequently been found under stones Kaltenbach states. In the case of hop plantations they also retire into the cracks of the poles, and they have been found upon the hop bines after they have been stacked for litter, as well as upon the ends of bines left in the hills or stocks during the winter. The females lay eggs which are rather large, spherical, and colourless, and are glued to the silky webs under the leaves. These are hatched in seven or eight days. The larva has six legs, but after the pupa, or nymph stage, there are eight legs, the full complement.

MEANS OF PREVENTION.

As English hop planters cannot irrigate the hop land, as is done in Tasmania, the only means of prevention are to apply hot lime or other caustic and pungent substances, as soot or lime, round the hop stocks in the late autumn after an attack, taking care that this should be put over the stocks and pieces of bine left on them. After an attack it would be of course desirable that the poles should be treated with a solution of paraffin or petroleum to kill the mites in their cracks. Practically, however, as hop planters would agree, this is almost impossible.

In the case of poles that are fixtures in the ground to carry wires or strings, according to the new methods of training hops, so much adopted in Germany and extending in this country, it would be well after an attack of red spiders to wash these poles with a strong solution of soft soap and water, with quassia added, or with paraffin or petroleum solutions brushed well into the crevices.

Poles should be well shaved before they are set up, as their bark harbours these mites and many insects injurious to hop plants.

REMEDIES.

Kaltenbach, the German entomologist, says that washing with water containing solutions of sulphur and tobacco may be advantageously employed. This was tried in 1868 in England

without much benefit. The only effectual remedy would appear to be washing the plants by means of hand or horse engines, with a composition of water, soft soap, and quassia, in the following proportions :—

100 gallons of water,
4 to 6 lbs. of soft soap,
4 to 6 lbs. of quassia (extract after well boiling).

Water alone would be effectual, only it runs off the web-covered leaves. The soap fixes it on them, and the bitter of the quassia makes them unpleasant to the tastes of the red spiders.

THE HOP CONE-STRIG MINERS (*Psylliodes attenuatus* ; or *Agromyza frontalis* ?).

During the last few years the hop cones in many parts of the hop-yielding districts have become rapidly red or rust-coloured some days before they were ready to be picked, and after a short time they have dried up, and their bracts have fallen to pieces. This was at first attributed to red mould or to red rust, but upon careful examination it has been found that the strigs or stalks of the cones had been bored or mined by an insect throughout. Moreover, in many of these mines little white maggots, the larvæ of an insect, were found.

It is a moot point as to what kind of insect these larvæ belong. Some are of opinion that they are the larvæ of a species of flea-beetle, of the tribe *Psylliodes*, either *Psylliodes attenuatus* or *Psylliodes chrysocephalus*, which, to a casual observer, resembles the common hop flea beetle, *Haltica concinna*. According to Taschenberg the larvæ of the latter commonly bore into bulbs or stalks of plants. Others hold that they are the larvæ of a species of fly, *Agromyza frontalis*, which are also known to be leaf and stalk miners. Miss Ormerod reports of some larvæ forwarded to her, together with the injured strigs of hop cones, that they decidedly were those of a dipterous insect, that is, of some two-winged fly. Miss Ormerod kept these larvæ, hoping to witness their transformation, but unfortunately they lost their vitality.

It is hoped that planters will send specimens of these to Miss Ormerod or to the writer, in order that they may be identified, and that means of prevention and remedies against their attacks may be prescribed, as the injuries caused by them are serious, and are, as it appears, on the increase.

C. W.

without much benefit. The only effecting remedy would appear to be the use of the pumice powder, which is known to be with a composition of water and soap, and applied in the following proportions:—one ounce of water, and half an ounce of pumice powder, mixed, and used as a wash.

Water alone would be effectual, only it is so off the web-covered leaves. The soap fixes it on them, and the bitter of the pumice makes them unpleasant to the taste of the red spider.

The red spider is a very common pest, and is found in all the gardens, and is very destructive to the plants. It is a small, round, red insect, with eight legs, and a very long, thin, black, thread-like body. It is very common in the gardens, and is very destructive to the plants. It is a small, round, red insect, with eight legs, and a very long, thin, black, thread-like body. It is very common in the gardens, and is very destructive to the plants.

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